

Robot-Assisted Surgery in Poland: The Past, the Present, and the Perspectives for the Future

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1. History and Evolution of Robot-Assisted Surgery in Poland

In recent decades, we have been witnessing a technological revolution in the area of minimally invasive urologic surgery, with robot-assisted surgery being one of the most game-changing inventions. Across the world, robotic systems were implemented into clinical practice shortly after development and certification, with the aim of providing a potential benefit in the functional outcomes of patients undergoing radical prostatectomy. However, in Poland, the adoption of robot-assisted surgery in urology has been markedly slower, for various reasons, including public health reimbursement issues, as well as the reluctance of some urologic surgeons to adopt this novel technology. Nevertheless, despite initial barriers, the adoption of robot-assisted surgery in Poland was inevitable, as reflected by the high numbers of cases currently performed across the country.

In the late 1990s and early 2000s, because no robotic systems were available in Poland, patients who opted for robot-assisted surgery instead of laparoscopic or open prostatectomy, and those who could afford it, travelled abroad in order to undergo the procedure in another country. The first surgical robot in Poland became available in 2010 in a major hospital in Wrocław. However, at that time, there were no regulations regarding the reimbursement of robot-assisted procedures by the National Insurance Company (Narodowy Fundusz Zrownia—NFZ), which is the only health insurance company financing surgical procedures in Poland. The NFZ is the governmental health insurance provider financed by compulsory insurance contributions. Consequently, despite initial enthusiasm, the use of robots was limited to a small volume of urologic or surgical cases only, which led to many controversies. Robotic systems became a target of negative media campaigns claiming that the purchase of a robot was a waste of money with no benefit to public health. In general, people viewed robot-assisted surgery as an expensive and non-reimbursed technology.

It took another six years for the next robot to appear in a Polish hospital, as a da Vinci system was installed in a major hospital in Toruń in 2016. The purchase and support of the system were funded with a public grant for modern surgical management of bladder cancer. However, during those years, neither of the two centers exceeded an annual volume of 60 robot-assisted procedures. By the end of 2021, after nearly 11 years, the center in Wrocław performed 406 cases, the majority of them being prostatectomies.



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However, starting in 2017, the development of private healthcare in Poland, which involved the establishment of multiple private hospitals across the country, has led to a rapid increase in the adoption of robotic systems in Poland. From 2017 to 2019, da Vinci systems were installed in 12 hospitals, eight of which were private institutions, mainly for the purpose of radical prostatectomy. Only one center (Poznań) was not performing urological procedures with their robot. Additionally, the Senhance system has been installed in one hospital in Cracow.

The introduction of multiple new robotic systems in the world and the accelerating increase in the volume of performed procedures, especially functional results for radical prostatectomies, resulted in a subsequent increase in the popularity of the technology in Poland. Improved access, lowered prices due to market competition, as well as positive patient opinions contributed to another great leap in 2020 to 2021. Despite no reimbursement of robot-assisted procedures, during this period, an additional 10 Polish hospitals (including eight public centers) began offering robot-assisted surgery with the da Vinci system. In three of the centers, the procedures were performed using robotic systems leased from another hospital.

In 2021 the first Versius system was installed in a Polish hospital in Łódź, which now has both Versius and da Vinci systems. The marketing strategy of the manufacturer (CMR Surgical) in Poland is based on renting, leasing, or installment purchases, significantly reducing the initial cost of investment. By the end of 2022, the Versius system had been installed in 12 new hospitals (including one private center that already owned the da Vinci system). Also, during this time, seven public hospitals purchased the da Vinci system (six new centers and one public center that already owned one), and one hospital began offering offer robot-assisted surgery using a leased system.

Initially, the cost of the majority of procedures was covered by the patients themselves in private centers. However, the volume of cases performed in public hospitals started to increase in 2019 (Table 1). The situation changed fundamentally after the introduction of the reimbursement of robot-assisted procedures by the national health insurance company (NFZ). This reimbursement decision was the culmination of a thorough governmental review which, among other analyses, engaged multidisciplinary panels. With the growing number of new centers, particularly public hospitals, which now offer robot-assisted radical prostatectomies, it appears inevitable that the data for 2022 will now demonstrate public centers performing more cases than private hospitals. As the reimbursement provided by the NFZ from 2022 has recently been significantly increased, most robot-assisted radical prostatectomies are now performed within the public health insurance system, regardless of center type (public or private; Figure 1).

Table 1. Numbers of Polish hospitals offering robot-assisted surgery (RAS) and procedures performed each year.

Year	Number of Hospitals Offering RAS		Number of Procedures	
	Public Centers	Private Centers	Public Centers	Private Centers
2010	1	0	6	0
2011	1	0	56	0
2012	1	0	41	0
2013	1	0	45	0
2014	1	0	35	0
2015	1	0	25	0
2016	2	0	33	0
2017	2	1	66	57
2018	4	4	56	324
2019	6	8	375	912
2020	10	8	579	1165
2021	14	10	1377	1396
2022	26	14	1863	2981

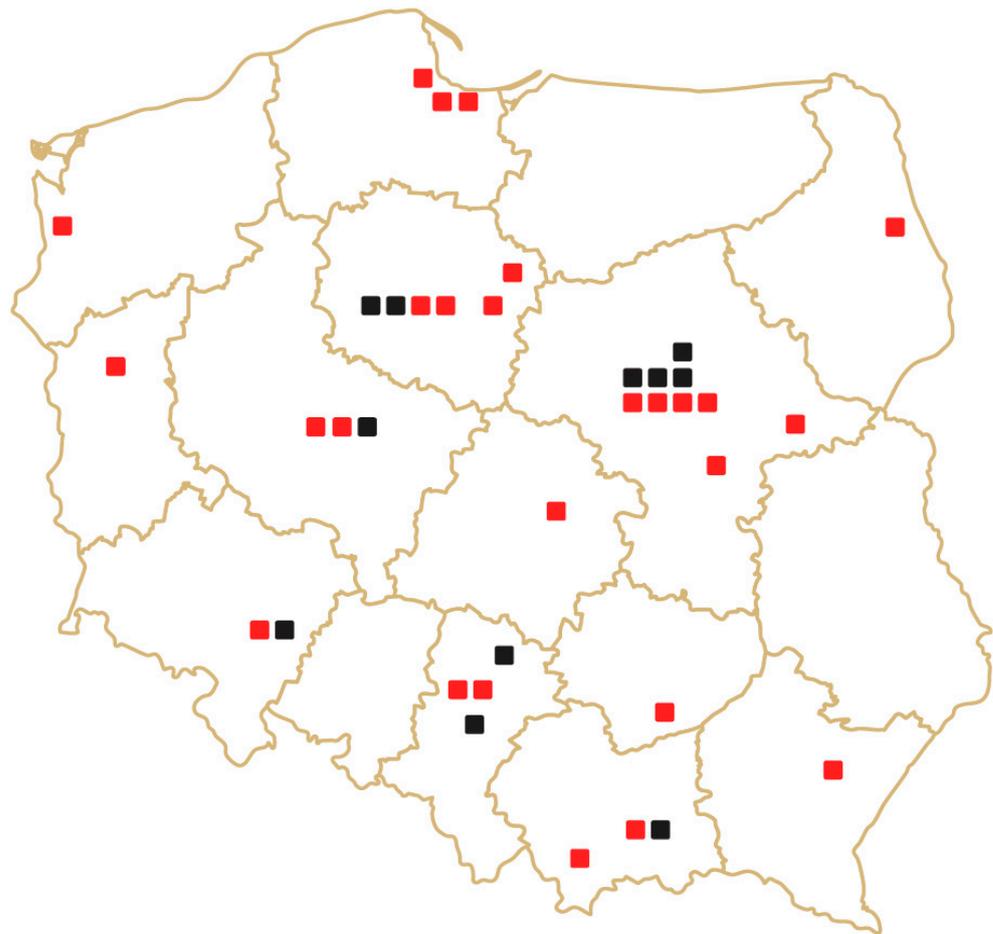


Figure 1. Geographic distribution of Polish centers offering robot-assisted surgery (public and private centers in black and red, respectively).

2. Summary of the Present State

As of the end of May 2023, 46 hospitals in Poland were offering robot-assisted procedures, including 12 private and 34 public centers (Table 2). Among these, 32 hospitals had the da Vinci system, 12 had the Versius system, 1 had both systems, and 1 had the Senhance system.

Table 2. Number of radical prostatectomies performed each year in Poland.

	Open RP (n)	Traditional Laparoscopy RP (n)	Robot-Assisted RP (n)	Total RP Cases (n)	NFZ-Reimbursed Cases (n)	Non-Reimbursed Cases (n)
2015	2860	1450	8	4318	4318	0
2016	3173	2074	5	5252	5252	0
2017	3350	2572	71	5993	5943	50
2018	3461	3311	306	7078	6777	301
2019	3343	3686	920	7949	7095	854
2020	2821	3402	1262	7485	6409	1076
2021	2332	3649	1790	7771	6523	1248
2022	2340	4232	3361	9933	9033	900
2023 *	2000	2700	6000	10,700	10,000	700

* Estimated numbers of RP—radical prostatectomy; NFZ—Narodowy Fundusz Zdrowia.

In 2022, 4844 robot-assisted procedures were performed in 40 hospitals. It is important to note that while the number of the procedures reimbursed by the NFZ can be easily accessed, there is no available registry of the procedures performed outside of the public health insurance, and the numbers provided are based on previous publications and data declared by the center officials. Of the 4844 cases, approximately 3360 (~69%) were radical prostatectomies and 2981 (~62%) were performed in public hospitals. All procedures were performed by approximately 130 surgeons.

3. Reimbursement and Financial Issues

Robot-assisted cases in Poland can be categorized into three types based on the source of financing: (a) fully reimbursed by the NFZ (~78% of cases), (b) fully paid by the patient (~19%), and (c) funded through research grants (~3%).

According to law regulations, a procedure reimbursed by the NFZ cannot be co-paid by the patient or any other institution. This may discourage hospitals from offering NFZ-reimbursed procedures if the reimbursement by the public insurance provider does not correspond with the actual cost of the surgery. Since 1 April 2022, new rules now favor high-volume centers, with the highest reimbursement being available for centers performing at least 100 prostatectomies annually, regardless of the method. If a robot-assisted prostatectomy is performed in such a high-volume center, the sum paid by the NFZ will be more than twice the sum paid for a prostatectomy performed in a low-volume hospital (defined as <70 cases annually), even if robot-assisted (average equivalent of USD 6300).

According to governmental analyses, in 2019 to 2021, NFZ reimbursement covered between 43% and 80% of the costs incurred by public hospitals performing robot-assisted surgeries. The recent tariff changes have made robot-assisted prostatectomies more financially viable for hospitals. RARP now generates a profit of approximately USD 1000 (excluding the cost of robotic system purchase from the calculation).

Another significant barrier to the wide adoption of robotic surgery in Poland is the price of purchasing a new robotic system, which has been particularly challenging for public hospitals, which are forced to seek various funding sources, including local public administration, European funds, or research grants. Depending on additional plans available for purchase along with the robotic system, the purchase prices paid by Polish public hospitals between 2020 and 2022 ranged from USD 1.8 to 3.6 million, with one outlier reaching an equivalent of USD 6.0 million.

An important limitation of the development of the robotic system is, of course, the cost of each procedure, including the cost of tools and service. Another important barrier was the embargo imposed by Intuitive Surgical from 2014 to 2017, which prevented the distribution of new da Vinci systems in Poland. The exact reason for this embargo remains unclear to the authors, though reimbursement issues are speculated to be among the possible explanations. During that time, five hospitals purchased used systems from middleman companies. Eventually, an appeal by the Polish government helped to lift the embargo in 2018.

4. Other Robotic Systems in Poland

Alongside the dynamic rise in the adoption of universal robotic systems such as da Vinci or Versius, several Polish hospitals are now using other specialized systems dedicated to orthopedics, neurosurgery, or ophthalmic surgery. In 2020, a hospital in Ostrów Mazowiecka began offering procedures assisted by the Navio robotic system by Smith & Nephew for knee surgery. In 2022, the same system was installed in Warsaw (Medical University of Warsaw). The Rosa system for neurosurgical procedures is available in Cracow (Jagiellonian University). Since 2022, the Avicenna Roboflex robotic system for renal lithiasis procedures has been available in Piaseczno. Between 2020 and 2022, five Polish hospitals started to use the ExcelsiusGPS robotic system for spine surgery and stereotactic neurosurgical procedures.

5. Robotics in Polish Urology—Perspectives for the Future

As described in the preceding paragraphs, in 2017, there were only three robotic systems available in Poland, and most of the procedures were expensive and not easily accessible to Polish patients. In Poland, there is no private insurance system that can reimburse robotic procedures, and there is no option to pay for procedures in public hospitals. However, within just five years, robot-assisted radical prostatectomy became a widely performed procedure across the country and reimbursed by the public healthcare system (Figure 2; Table 2). This rapid evolution was unprecedented and unexpected; therefore, the future of robotics in Polish urology remains unpredictable.

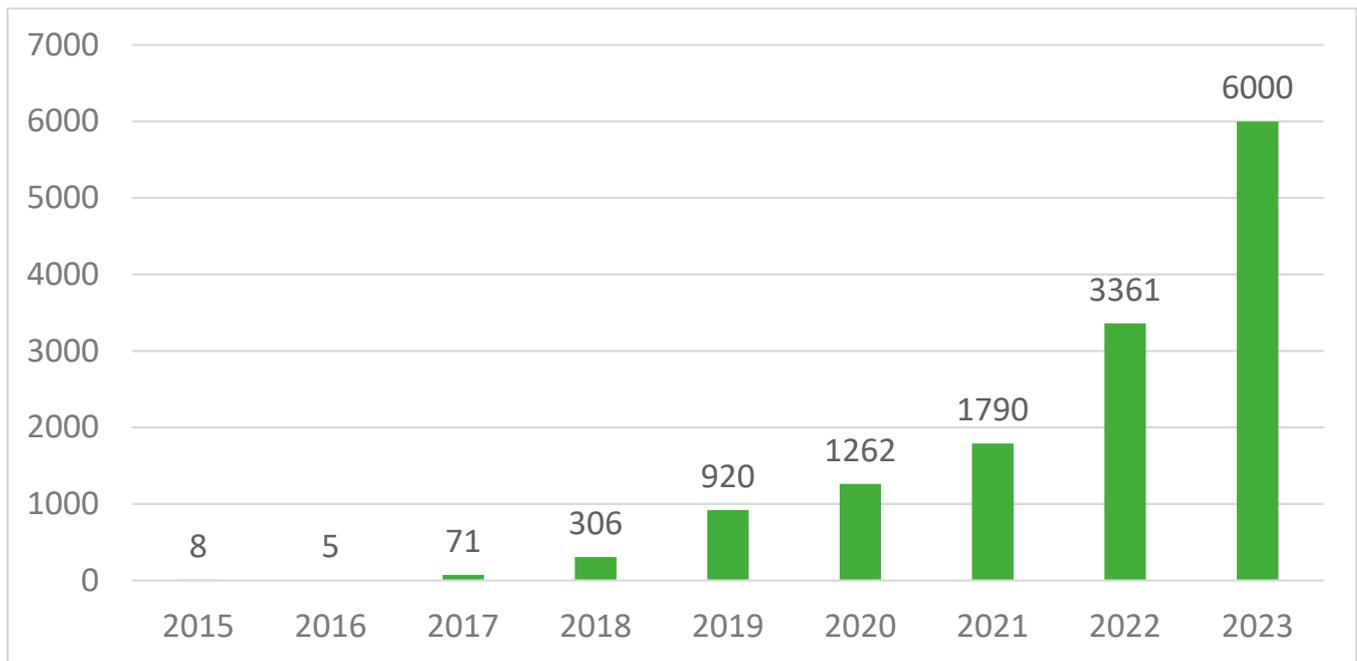


Figure 2. Chronological trend (2016 to 2023) in annual robot-assisted prostatectomies volume in Poland (number is estimated for 2023).

We believe that this major leap in the adoption of robotic systems in Polish hospitals has resulted from a positive feedback loop. As robots became more accessible, robot-assisted surgery became more popular among patients, leading to increased demand, which in turn made robots more accessible, and so on. Most probably, the most important event in the development of this loop was the decision of the Polish government to offer financial reimbursement for robot-assisted radical prostatectomy, or even the anticipation of this decision in the preceding year. In our opinion, the market has not reached saturation yet, and with the contemporary rate of the adoption of robotic systems, we anticipate that by the end of this decade, all or nearly all radical prostatectomies in Poland will be performed using robot-assisted surgery. However, as regulations established by the Polish public health insurance provider are dependent on the government and can be influenced by contemporary political issues, definite forecasts cannot be made.

While the vast majority of urologic cases performed with robotic systems are radical prostatectomies, various other robot-assisted urologic procedures are being introduced in Poland, as mentioned earlier in the text. Perhaps the trend observed for radical prostatectomies will be followed in those other fields as well.

Conflicts of Interest: The authors declare no conflict of interest.

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